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IS : 8972 - 1978

Indian Standard
METHOD FOR
DETERMINATION OF COEFFICIENT
OF FRICTION OF FOODGRAINS

UDC 633.1 : 531.43.081.6



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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Price Rs 5.00

Gr 2

March 1979

Indian Standard

METHOD FOR DETERMINATION OF COEFFICIENT OF FRICTION OF FOODGRAINS

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Indian Standard

METHOD FOR DETERMINATION OF COEFFICIENT OF FRICTION OF FOODGRAINS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 20 November 1978, after the draft finalized by the Storage Structures and Storage Management Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Coefficient of friction is important in designing a structure for storage of grains in bulk. Several methods are currently being used to measure the coefficient of friction. Because of different methods used by agricultural scientists, it is not possible to have reproducible figures of coefficient of friction of various foodgrains. Thus the designing of bulk storage structures is handicapped. This standard, therefore, prescribes a method for measuring the coefficient of friction. Adoption of this standard would enable the compilation of data from all research workers on a uniform basis.

0.3 For the convenience of design engineers, some of the observed values of coefficient of friction of grains supplied by the Department of Processing and Agricultural Structures, College of Agricultural Engineering, Punjab Agricultural University, Ludhiana are given in Appendix A for guidance. The coefficient of friction varies with moisture content, variety of grains, etc, and, therefore, caution should be exercised in adopting the figures of coefficient of friction given in Appendix A.

0.4 In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes the method for determination of coefficient of friction of foodgrains for bulk storage purposes.

*Rules for rounding off numerical values (*revised*).

2. APPARATUS

2.1 Tilting table with provision for fixing plywood, plain galvanized iron sheet, steel plate or any other test material surface.

2.2 Rectangular frame of 150 × 150 mm size.

3. GRAIN

3.1 The grain of which the coefficient of friction is to be determined shall be cleaned so that it does not have refractions [*see* IS : 4333 (Part I)-1967*] more than 0.5 percent. It should also be free from insect pests.

3.2 The grain shall be of the same variety.

3.3 The moisture should be measured in accordance with IS : 4333 (Part II)-1967† and stated in the test report.

4. PROCEDURE

4.1 The grain (*see* 3) shall be kept in a rectangular frame (*see* 2.2) placed in such a way that only the grain and the surface of the tilting table (*see* 2.1) are in contact.

4.2 The angle of the table which first induced sticking shall be measured.

4.3 Calculate the coefficient of friction as the tangent of angle measured in 4.2 above.

4.4 At least five test observations must be taken and the average of these values should be taken.

5. TEST REPORT

5.1 The test report should indicate all the characteristics of the grain (*see* 3.1) and whether the grain has been graded or not before undertaking the measurement of coefficient of friction.

*Methods of analysis of foodgrains: Part I Refractions.

†Methods of analysis of foodgrains: Part II Moisture.

APPENDIX A

(Clause 0.3)

COEFFICIENT OF FRICTION OF MAIZE AND PADDY

Sl No.	Commodity	Variety	Moisture Range (Percent Dry Basis)	Angle of Static Friction in Degrees		Coefficient of Static Friction	
				Plywood	PGI Sheet	Plywood	Sheet
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Maize	Local	Less than 10	12.3	13.2	0.218	0.234
		Ganga-5		12.8	13.1	0.227	0.232
		Vijay Composite		13.0	13.3	0.230	0.236
ii)	Maize	Local	10 to 19.9	13.8	15.6	0.245	0.279
		Ganga-5		13.9	15.7	0.247	0.281
		Vijay Composite		14.3	15.5	0.254	0.277
iii)	Paddy	IR-8	Less than 10	21.5	18.2	0.393	0.328
		Jhona-351		18.8	14.3	0.340	0.254
		Jaya		19.4	16.1	0.352	0.288
iv)	Paddy	IR-8	10 to 19.9	22.2	19.3	0.408	0.350
		Jhona-351		19.6	16.9	0.356	0.303
		Jaya		20.8	18.1	0.379	0.326

INDIAN STANDARDS

ON

STORAGE STRUCTURES AND STORAGE MANAGEMENT

IS:

- 607-1971 Code of practice for construction of bagged foodgrain storage structures (*second revision*)
- 631-1977 Aluminium foodgrain storage bins (*first revision*)
- 3453-1966 Code of practice for construction of hexagonal type concrete-cum-masonry bins for bulk storage of foodgrains
- 5503 (Part I)-1969 General requirements for silos for grain storage: Part I Constructional requirements
- 5503 (Part II)-1969 General requirements for silos for grain storage: Part II Grain handling equipment and accessories
- 5606-1970 Steel bins for grain storage
- 5826-1970 Constructional requirements for flat storage structures for grain (capacity above 200 tonnes)
- 6151 (Part I)-1971 Storage management code: Part I Terminology
- 6151 (Part II)-1971 Storage management code: Part II General care in handling and storage of agricultural produce and inputs (*superseding* IS : 610-1955 and IS : 611-1955)
- 6151 (Part III)-1976 Storage management code: Part III Specific care in handling and storage of agricultural produce and inputs
- 6201-1971 Constructional requirements for flat storage structures for grains (100 to 200 tonnes capacity)
- 6663-1972 Method for determination of angle of repose of grains
- 7147 (Part I)-1973 Steel bins for domestic storage: Part I *Gharelu Kothi*
- 7247 Code of practice for fumigation of agricultural produce:
 - (Part I)-1973 Methyl bromide
 - (Part II)-1973 Ethylene dibromide
 - (Part III)-1973 Aluminium phosphide
 - (Part V)-1975 EDCT mixture
- 7715-1975 Methods for testing suitability of bins for safe storage of foodgrains
- 7716-1975 Methods for testing efficacy of fumigation for disinfestation of grains in domestic bins
- 8453-1977 Code of practice for construction of polyethylene embedded earthen bins for bulk storage of foodgrains